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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/650,677	08/29/2003	Masaaki Ikegami	402748	7760

23548 7590 12/02/2004

LEYDIG VOIT & MAYER, LTD
700 THIRTEENTH ST. NW
SUITE 300
WASHINGTON, DC 20005-3960

EXAMINER	
NOVACEK, CHRISTY L	
ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/650,677	IKEGAMI, MASAAKI	
	Examiner	Art Unit	
	Christy L. Novacek	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 2-4 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 2-4 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/966,071.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/29/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the communication filed August 29, 2003.

Specification

The disclosure is objected to because of the following informalities: In the first paragraph on page 1 of the specification, a reference to the application's parent case 09/966071 must be inserted. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Line 24 in amended claim 2 recites the limitation of "removing a removed portion in said thin uniform oxide". It is unclear how a portion that has been removed once can be removed again in another step. Similarly, lines 27-28 in amended claim 2 recite, "thereby forming a contact including the removed portion." It is unclear how something that has been removed can form a contact.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in view of Chien et al. (US 5,328,867, cited in IDS) and Nagatomo (US 5,194,404, cited in IDS).

Regarding claim 2, the admitted prior art discloses laminating an insulating oxide film (7) and a first poly-silicon film (10) sequentially in order on a silicon layer (8) of a first conductivity type, forming an opening by selectively etching the insulating oxide film and first poly-silicon film and exposing a part of the silicon layer in the opening, forming an impurity doped region (9) of a second conductivity type by implanting a dopant impurity producing the second conductivity type into the part of the silicon layer exposed in the opening, forming a second poly-silicon film (11) covering the first poly-silicon film, including in the opening and implanting the dopant impurity producing the second conductivity type in the second poly-silicon film, and activating the impurity producing the second conductivity type implanted in the second poly-silicon film and diffusing the dopant impurity producing the second conductivity type into the first poly-silicon film (Fig. 5-8; pg. 1, ln. 15 – pg. 5, ln. 12).

The admitted prior art discloses that a cleaning process including a deionized (DI) water rinse leaves impurities on the surface of the silicon surfaces that reacts to form a natural oxide layer of uneven thickness on the silicon, but does not disclose removing the natural oxidation film by hydrofluoric acid and forming a thin uniform oxide on the surface of the impurity doped region in the opening and on the first poly-silicon film after the natural oxidation film has been removed. Like the admitted prior art, Chien discloses forming a natural oxide film of uneven thickness on a silicon substrate in an area of the substrate that will be required to form a contact.

Chien teaches that the uneven natural oxide can detrimentally affect the semiconductor device because it acts as a diffusion barrier between contacts, thus increasing the resistance between the contacts. Chien teaches that the solution to this problem is to remove the uneven natural oxide layer with hydrofluoric acid and then forming a thin uniform oxide film on the surface from which the uneven natural oxide film has been removed (col. 3, ln. 21-45). Chien states that this process is applicable to the creation of BiCMOS integrated circuits. At the time of the invention, it would have been obvious to one of ordinary skill in the art to remove the uneven natural oxide layer of the admitted prior art and replace it with a uniform oxide film as taught by Chien because Chien teaches that an uneven oxide layer formed between contacts can act as a diffusion barrier that inhibits the function of the integrated circuitry.

Chien does not teach removing a portion of the thin uniform oxide layer. Like Chien, Nagatomo discloses a process of forming contacts in integrated circuitry wherein a thin oxide film is formed between contact layers. Nagatomo teaches that an anneal at a temperature of 900-1150°C for 10 seconds can both activate doped impurities and also destroy the thin oxide film, thus reducing resistance between the contact layers and improving the speed at which the integrated circuitry can function (col. 3, ln. 23-36). At the time of the invention, it would have been obvious to one of ordinary skill in the art to anneal the substrate of the admitted prior art as modified by Chien to destroy the thin uniform oxide film as taught by Nagatomo because Nagatomo teaches that this process reduces resistance between the contacts and thereby improves the function of the integrated circuitry.

Regarding claim 3, Chien teaches forming the thin uniform oxide film by treating the substrate with hydrogen peroxide.

Regarding claim 4, Chien discloses that the thin uniform oxide can be 1-3 nm thick.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
November 23, 2004

AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800